Didelphids (Marsupialia) and *Uintasorex* (?Primates) from later Eocene Sediments of San Diego County, California

Jason A. Lillegraven

ABSTRACT.—Fossil teeth of three species of small mammals from early Uintan (roughly mid Eocene) terrestrial deposits of western San Diego Co., California are compared with approximately contemporaneous similar species from the North American Rocky Mountain and High Plains states. Two species of opossums (didelphid marsupials) were discovered: *Peratherium* sp. cf. *P. knighti* and *Nanodelphys californicus.* The former cannot be distinguished from *P. knighti* McGrew, 1959 common in Bridgerian (roughly late early Eocene) sediments of Wyoming. *Peratherium* sp. cf. *P. knighti* is also present in the lower Sespe Formation of Ventura Co., California and was first recognized as "*Peratherium* species" by Stock (1936). *Peratherium californicum* Stock, 1936 in actuality represents a species of *Nanodelphys* McGrew, 1937. The suffix of the trivial name is here emended. *Nanodelphys californicus* is morphologically indistinguishable from *N. minutus* McGrew, 1937 from Oligocene sediments of Nebraska but a separate species designation is maintained for strictly stratigraphic reasons. The San Diego *Nanodelphys* specimens are the oldest yet known, but show fully developed all the characters diagnostic of the genus. Thus Bridgerian or even Wasatchian (early Eocene) species might someday be expected to be found. The new species of tiny uintasoricine ?primate, *Uintasorex montezumicus,* shows several dental specializations beyond those seen in *U. parvulus* (common in Bridgerian sediments of Wyoming). *Nanodelphys* and *Uintasorex* were previously recognized only from the Rocky Mountain and High Plains states.

All three species were represented by rat- to tiny mouse-sized animals, were probably at least semi-arboreal in habits, and are extremely similar to or conspecific with species from the Rockies and High Plains. Overland dispersal routes must have been readily available between the two areas during at least part of the early Eocene and they probably involved rather continuous tropical forest or at least savannah-like settings.

Among the large and diverse land vertebrate fauna recently collected from the later Eocene sediments of San Diego Co., California are the teeth of three species of small mammals that are of considerable interest because of their biogeographical implications. They represent two genera previously unrecorded from the North American West Coast as well as a new species. The study is one part of a larger revision of the West Coast later Eocene terrestrial vertebrate fauna. Completed parts include papers by Lillegraven and Wilson (1975), Novacek (in prep.), Schatzinger (1975), and Schiebout (Ms).

All measurements are in millimeters and were taken on an Ehrenreich Photo-Optical Industries (EPOI) "Shopscope." Criteria used for orientation of axes of measurement are described below for each taxon.

ABBREVIATIONS USED

AMNH, Department of Vertebrate Paleontology, American Museum of Natural History. LACM (CIT), Section of Vertebrate Paleontology, Natural History Museum of Los Angeles County (specimen numbers and locality numbers from an older California Institute of Technology collection purchased by the LACM). UCMP, Museum of Paleontology, University of California, Berkeley. V-72157, UCMP vertebrate locality number (detailed locality descriptions on file at UCMP). YPM, Peabody Museum of Natural History, Yale University.

A-P, Anteroposterior length. ANT-W, Anterior width of upper cheek teeth. POST-W, Posterior width of upper cheek teeth. W, Width of premolars. W-TRI, Width of trigonid. W-TAL, Width of talonid. O. R., Observed range of variation. $\bar{X}$, mean of sample. $SE_{\bar{X}}$, Standard error of mean. S. D., Standard deviation. V, Coefficient of variation.

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SYSTEMATIC PALEONTOLOGY

Subclass THERIA Parker & Haswell, 1897
Infraclass METATHERIA Huxley, 1880
Order MARSUPIALIA Illiger, 1811
Family DIDELPHIDAE Gray, 1821
Genus *Peratherium* Aymard, 1850

Peratherium sp. cf. *P. knighti* McGrew, 1959

Pl. 1, fig. 1; Pl. 2, figs. 1-3; Pl. 3, figs. 1-3; Pl. 4, figs. 1-4; Pl. 5, figs. 1-2

Type.—AMNH 55684, right maxilla with $M^{1\text{-}3}$.

Type locality.—University of Wyoming loc. 5, Bridger Fm., Tabernacle Butte, Sublette Co., Wyoming.

West Coast referred specimens.—7 "DP^3's," 5 P^2's, 2 P^3's, 23 M^1's, UCMP 106376 (maxillary fragment with $M^{2\text{-}3}$), 11 M^2's, 13 M^3's, 11 M^4's, 2 "DP_3's," 3 P_2's, 6 P_3's, UCMP 110224 (dentary fragment with $M_{1\text{-}2}$), 16 M_1's, 12 M_2's, 10 M_3's, 13 M_4's (all UCMP specimens).

West Coast localities.—Friars Fm.: V-6882, V-68116, V-71175, V-71183; Mission Valley Fm.: V-71180, V-71211, V-72157, V-72158, V-72176, V-72179, V-73138, V-73139; ?Santiago Fm.: V-72088.

Distribution of species.—Bridger (Bridgerian) and Tepee Trail (Hendry Ranch Member, Uintan) formations, Wyoming; Friars and Mission Valley formations (Uintan), California.

Remarks.—Publications on North American early Tertiary didelphids are numerous, scattered, and probably far to many species have been named to account for the actual diversity. Setoguchi (1973) recently provided an extremely useful summary of species-level systematic problems within the group, and the present paper should be considered supplementary to his.

The San Diego specimens of *Peratherium* are indistinguishable from *P. knighti* McGrew, 1959 from the Bridgerian of Wyoming and are identical in most respects to specimens identified as *P.* sp. cf. *P. knighti* by Setoguchi (1973) from the Uintan Tepee Trail Fm. of Wyoming. All measurements (Tables 1 and 2) agree well with those of *P.* sp. cf. *P. knighti* as described by Setoguchi (1973, Table 2, p. 20) and are significantly smaller than those referred by him (Table 1, p. 15) to *P. marsupium* (Troxell, 1923).

Measurements on marsupial molars in this paper were taken as illustrated by me in 1969 (p. 16, Fig. 5). Premolar measurements were simply taken with the A-P axis being designated parallel to the longest axis of the tooth with W measurements taken at right angles to it at the widest part of the tooth. Although teeth from 13 localities and 3 formations are included within the San Diego sample, the vast majority of specimens were recovered from but 2 spatially close localities (V-72157 and V-72158) in the Mission Valley Fm. Only three specimens (UCMP 106613, 106731, and 110368) were collected from the more distant ?Santiago Fm. locality (V-72088). No significant differences could be detected between specimens from the various localities and almost surely only a single species is involved. Thus I felt justified in lumping all data into a single statistical sample. Minor differences between the San Diego specimens (Pl. 1, fig. 1; Pl. 2, figs. 1-3; Pl. 3, figs. 1-3) and those identified as *Peratherium* sp. cf. *P. knighti* by Setoguchi (1973) from the Tepee Trail Fm. include the following. A paraconule is commonly seen in M^1 of the San Diego sample, although the cuspule is quite weak; there is no trace of a paraconule on M^1 in the Wyoming sample. The San Diego M^3's usually have a small stylar cusp C (very conspicuous in Tepee Trail specimens) and usually possess a small stylar cusp D (absent in Tepee Trail M^3's). Finally, the vertical part of the buccal border of the stylar shelf of M^3's from San Diego is variably crenulated rather than smooth as in the Wyoming specimens. If one assumes that Tertiary didelphids were ultimately derived from Late Cretaceous ancestral stocks similar to *Alphadon marshi* (see Clemens, 1966, p. 5) or *A. wil-*

TABLE 1. Standard statistics for lower teeth of *Peratherium* sp. cf. *P. knighti* from San Diego County, California.

		N	O. R.	$\bar{x}$	S. D.	$SE_{\bar{x}}$	V
"DP_3"	A-P	1	1.563				
	W-TRI	1	0.802				
	W-TAL	1	0.883				
P_2	A-P	3	1.123–1.340	1.258			
	W	3	0.535–0.621	0.577			
	A-P/W	3	2.099–2.280	2.179			
P_3	A-P	6	1.568–1.778	1.691	0.085	0.035	5.0
	W	6	0.661–0.826	0.746	0.060	0.025	8.0
	A-P/W	6	2.153–2.629	2.274	0.177	0.072	7.8
M_1	A-P	16	1.703–2.136	1.923	0.113	0.027	5.9
	W-TRI	16	0.832–0.990	0.894	0.045	0.011	5.0
	W-TAL	16	0.818–1.052	0.973	0.059	0.014	6.1
	W-TRI/W-TAL	16	0.852–1.039	0.920	0.048	0.012	5.2
	A-P/W-TRI	16	1.999–2.320	2.153	0.097	0.023	4.5
	A-P/W-TAL	16	1.814–2.082	1.977	0.075	0.018	3.8
M_2	A-P	12	1.823–2.165	1.999	0.118	0.033	5.9
	W-TRI	12	0.970–1.232	1.128	0.070	0.019	6.2
	W-TAL	12	0.973–1.228	1.130	0.066	0.018	5.8
	W-TRI/W-TAL	12	0.952–1.132	0.999	0.051	0.014	5.1
	A-P/W-TRI	12	1.513–1.969	1.779	0.152	0.042	8.5
	A-P/W-TAL	12	1.518–1.945	1.775	0.130	0.036	7.3
M_3	A-P	10	1.848–2.274	2.044	0.130	0.041	6.4
	W-TRI	10	1.102–1.305	1.199	0.065	0.021	5.4
	W-TAL	9	1.010–1.193	1.113	0.056	0.019	5.0
	W-TRI/W-TAL	9	1.037–1.107	1.075	0.023	0.008	2.1
	A-P/W-TRI	10	1.661–1.777	1.705	0.039	0.012	2.3
	A-P/W-TAL	9	1.730–1.924	1.837	0.071	0.024	3.9
M_4	A-P	11	1.718–2.205	1.955	0.150	0.045	7.7
	W-TRI	10	0.966–1.171	1.065	0.071	0.022	6.7
	W-TAL	12	0.613–0.935	0.758	0.100	0.029	13.2
	W-TRI/W-TAL	10	1.188–1.732	1.413	0.168	0.053	11.9
	A-P/W-TRI	10	1.691–1.985	1.823	0.101	0.032	5.5
	A-P/W-TAL	10	2.280–3.160	2.571	0.290	0.092	11.3

TABLE 2. Standard statistics for upper teeth of *Peratherium* sp. cf. *P. knighti* from San Diego County, California.

		N	O. R.	$\bar{x}$	S.D.	SE$_{\bar{x}}$	V
"DP^3"	A-P	7	1.387-1.623	1.500	0.078	0.030	5.2
	ANT-W	7	0.868-0.992	0.929	0.043	0.016	4.6
	POST-W	7	1.162-1.500	1.326	0.100	0.038	7.5
	ANT-W/POST-W	7	0.610-0.769	0.703	0.052	0.020	7.4
	A-P/ANT-W	7	1.526-1.691	1.615	0.069	0.026	4.3
	A-P/POST-W	7	0.975-1.301	1.137	0.107	0.040	9.4
P^2	A-P	5	1.278-1.565	1.435	0.111	0.050	7.7
	W	5	0.590-0.707	0.661	0.047	0.021	7.1
	A-P/W	5	1.888-2.334	2.176	0.174	0.078	8.0
P^3	A-P	2	1.746-1.819	1.783			
	W	2	0.900-1.048	0.974			
	A-P/W	2	1.666-2.021	1.844			
M^1	A-P	16	1.334-2.137	1.902	0.198	0.050	10.4
	ANT-W	18	1.189-1.820	1.594	0.163	0.038	10.2
	POST-W	17	1.578-2.458	2.046	0.218	0.053	10.7
	ANT-W/POST-W	14	0.718-0.874	0.817	0.041	0.011	5.0
	A-P/ANT-W	14	1.002-1.319	1.154	0.089	0.024	7.7
	A-P/POST-W	14	0.742-1.073	0.943	0.089	0.024	9.4
M^2	A-P	7	1.681-2.227	2.008	0.200	0.076	10.0
	ANT-W	7	1.665-2.258	2.074	0.216	0.082	10.4
	POST-W	8	2.143-2.488	2.360	0.099	0.035	4.2
	ANT-W/POST-W	5	0.883-0.921	0.908	0.015	0.006	1.6
	A-P/ANT-W	5	0.913-0.990	0.957	0.032	0.014	3.3
	A-P/POST-W	5	0.835-0.899	0.868	0.030	0.013	3.5
M^3	A-P	13	1.664-2.107	1.937	0.150	0.041	7.7
	ANT-W	12	1.872-2.538	2.293	0.170	0.049	7.4
	POST-W	11	1.993-2.918	2.508	0.222	0.067	8.9
	ANT-W/POST-W	11	0.848-0.961	0.914	0.036	0.011	3.9
	A-P/ANT-W	11	0.752-0.927	0.849	0.054	0.016	6.4
	A-P/POST-W	11	0.714-0.835	0.775	0.041	0.012	5.3
M^4	A-P	8	1.250-1.529	1.387	0.118	0.042	8.5
	ANT-W	5	1.935-2.408	2.133	0.173	0.077	8.1
	POST-W	7	1.218-1.590	1.381	0.128	0.048	9.3
	ANT-W/POST-W	5	1.381-1.727	1.581	0.150	0.067	9.5
	A-P/ANT-W	5	0.605-0.738	0.649	0.053	0.024	8.2
	A-P/POST-W	5	0.908-1.083	1.022	0.068	0.031	6.7

soni (see Lillegraven, 1969, p. 39), all the comparisons discussed above show the more primitive conditions in the San Diego specimens and have similarity with the holotype of *P. knighti* (see McGrew, 1959, p. 147, Fig. 3).

Description of permanent premolars.—No upper or lower premolars have yet been found in association with molars of *Peratherium* from the San Diego samples. Identification of permanent premolars was thus made with good confidence on the basis of similarities with Late Cretaceous species of *Alphadon* (see Lillegraven, 1969:32-42) and Oligocene species of *Peratherium* (*e.g.*, Stock and Furlong, 1922: 313-316). Because there are no adequate descriptions of the premolars of *Peratherium*, I briefly describe them here.

The P^3 (Pl. 5, fig. 2) has a single main cusp with a rounded anterior face and a sharp posterior crest. Only a hint of an anterior accessory cusp occurs and short cingula extend from it posterodorsad on either side of the tooth. The posterior crest of the main cusp has a distinct elevation at about the midpoint of its length in the unworn condition. The posterolabial surface of the tooth is slightly convex while the posterolingual surface is distinctly concave. The widest part of the tooth is approximately two-thirds the distance posterior from the front margin. A distinct cingulum extends anterodorsad to the widest part of the tooth on both sides from the posterior termination of the crest of the main cusp. The anterior root is markedly convex anteriorly and the anterior-most part of the convexity projects well ahead of the forward-most part of the crown. The posterior root is vertically straight and centers above the midpoint of the posterior ridge of the main cusp.

The P^2 (Pl. 5, fig. 1) is basically similar to P^3 except for its smaller size, generally more transversely compressed proportions, and vertically straighter anterior root. More anterior parts of the upper dentition have not as yet been recognized from the available samples.

The P_3 (Pl. 4, fig. 3) has the apex of the main cusp directly above the center of the anterior root. The anterior border of the main cusp is markedly convex and bluntly keeled. Only the slightest bump on some specimens suggests the incipient development of an anterior accessory cusp. A sharper crest curves gracefully from the main cusp posteroventrad to a small but sharp posterior accessory cusp. A cingulum curves linguad then anteriad from the apex of the posterior accessory cusp to terminate on the posterolingual base of the main cusp. The area between the cingulum and the posterior ridge of the main cusp is strikingly concave and usually is heavily worn. The entire labial surface of the tooth is distinctly convex and quite smooth.

The P_2 (Pl. 4, fig. 2) is virtually identical to the P_3 except for its smaller size and slightly greater tendency toward the development of an anterior accessory cusp. No parts of the more anterior lower dentitions of *Peratherium* have yet been recognized from the San Diego samples.

Description of "deciduous premolars."—A series of seven upper and two lower teeth has been recovered from the San Diego samples that show features characteristic of teeth usually designated as "DP^3_3" in modern didelphids. Archer (1974) documented the fact that, at least in some generalized Australian polyprotodont marsupials, the tooth usually referred to as "DP^3" in American kinds (or "dP^4" in traditional Australian terminology) is in reality the first tooth developed in a molariform series of sequentially related teeth including "DP^3M^{1-4}." He showed that it is not a member of the premolar series at all and especially should not be considered a "deciduous" precurser for another later-developing premolar. Nevertheless, the terminology of "DP^3_3" and "deciduous" as used for those teeth is deeply entrenched in the literature and is widely used. Until the phenomenon characteristic of Australian polyprotodonts is found to be general for the American kinds, it is probably best to retain the older terminology; I have done so in the present paper but have consistently placed "DP^3_3" and "deciduous" within quotation marks.

To my knowledge, "deciduous premolars" have not previously been described for either *Peratherium* or *Nanodelphys*. Even the smallest of these peculiar teeth is as large or larger than the M^1_1 of *Nanodelphys*. In all modern didelphids seen by me the "DP^3_3" is roughly one-third smaller than M^1_1. This size relation holds between the "DP^3_3's" in question and the M^1_1's of *Peratherium* within the San Diego samples. Thus I have identified all the "deciduous" teeth as representing *Peratherium*. That being the case, no "deciduous premolars" are yet recognized for *Nanodelphys* from the San Diego localities. The washing-screen size used in collecting the sample had spaces between the wires measuring roughly 0.72 mm. Unfortunately, therefore, one might expect common loss during the collecting process of teeth in the size range expected for "DP^3_3's" of *Nanodelphys*.

The "DP^3" (Pl. 4, fig. 4) is a highly distinctive tooth in its usual lack of a stylar shelf anterior to a transverse line drawn through the postparacrista. On two of seven specimens the stylar shelf lateral to the paracone is represented by a mere cingulum. The posterior part of the stylar shelf, however, is dramatically produced as a great wing projecting well posterior to the metacone. The result is that the apex of the metacone is only a slight distance posterior and labial to the geometrical center of the tooth as seen in occlusal view. Cuspules in the comparable position of "C" and "D" in molars are conspicuously developed and elongated parallel to the labial margin of the tooth. The two cuspules tend to merge to varying degrees and a raised crest proceeds posteriad along the labial margin of the tooth from cuspule "D" to the extreme posterolabial corner of the tooth. There is no stylar cusp "E" as such. A small "parastyle" is present directly anterior to the paracone such that a straight line can usually be drawn through the apices of the "parastyle," paracone, and metacone.

The metacone of "DP^3" is a significantly taller and more voluminous cusp than the paracone. The latter is a conical spire that usually lacks a preparacrista and has a weak postparacrista that heads directly toward the apex of the metacone. The premetacrista is generally weak, but the postmetacrista is a strong crest that projects all the way to the posterolabial corner of the tooth. A tendency exists for the development of a weak crest from the apex of the metacone to stylar cusp "D." Conular development is highly irregular, but para- and metaconules usually are present but miniscule and are essentially without wings. The protocone is low, transversely narrow, and anteroposteriorly broad. It lacks lingual cingula and has a broadly rounded lingual face. The preprotocrista usually continues as a cingulum to the apex of the "parastyle." The postprotocrista terminates on the lingual base of the metacone. The protoconal basin is deep. Although usually completely broken away, UCMP 109671 shows that the "DP^3" was three-rooted as in living didelphids with the metaconal root being the broadest and strongest.

The paraconid of "DP_3" (Pl. 4, fig. 1) is very low, being little more than an anterolingual inflection of the strong, sharp anterior crest of the protoconid. The posterior face of the trigonid has a shallow posterior slope down from apices of the proto- and metaconids. The talonid is complete with the cuspules arranged in the fashion characteristic of molars of *Peratherium* in that the low and flattened hypoconulid is nearly directly posterior to the entoconid. The cristid obliqua terminates at the base of the transverse center of the trigonid wall. A short posterior cingulum courses sharply labioventrad from near the apex of the hypoconulid. There seems to have been no anterolingual cingulum in contrast to molar structure.

Genus *Nanodelphys* McGrew, 1937

Nanodelphys californicus (Stock, 1936)

Pl. 5, fig. 3; Pl. 6, fig. 1; Pl. 7, figs. 1-2; Pl. 8, fig. 1; Pl. 9, figs. 1-3

Peratherium californicum Stock, 1936.

Type—LACM (CIT) 1943, right dentary fragment with $P_3M_{1\text{-}2}$.

Type locality.—LACM (CIT) locality 202, Sespe Fm., Ventura Co., California.

Referred specimens from San Diego County—3 P^2's, 1 P^3, UCMP 101933 (maxillary fragment with incomplete P^3 and $M^{1\text{-}2}$), 14 M^1's, 13 M^2's, UCMP 104414 (maxillary fragment with $M^{2\text{-}3}$), 14 M^3's, 4 M^4's, 16 miscellaneous upper molar fragments, 3 P_3's, UCMP 104153 (dentary fragment with talonid of M_1 and $M_{2\text{-}3}$), 17 M_1's, 12 M_2's, 12 M_3's, 6 M_4's, 3 miscellaneous lower molar fragments (all UCMP specimens).

Localities.—Friars Fm.: V-6871, below V-68101, V-68116, V-68118, V-71175, V-71183, V-72175; Mission Valley Fm.: V-71180, V-71187, V-71211, V-72157, V-72158, V-73138; ?Santiago Fm.: V-72088; Sespe Fm.: LACM (CIT) loc. 202.

Distribution of species.—Friars, Mission Valley, ?Santiago, and Sespe formations (Uintan), California.

Remarks.—Specimens of the genus *Nanodelphys* have previously been recovered from Orellan (roughly middle Oligocene) deposits in Nebraska, Colorado, South Dakota, and possibly in Chadronian (early Oligocene) deposits of Saskatchewan. Numerous upper molars (Pl. 5, fig. 3; Pl. 6, fig. 1; Pl. 7, fig. 1) have been found in the San Diego area having features characteristic of the genus. These are primarily: (1) that the para- and metacones are roughly equal in height (paracone markedly reduced in $M^{1\text{-}3}$ in *Peratherium*); (2) that the conules are greatly reduced or absent (usually clearly present in *Peratherium*); and (3) that stylar cusp "C" is greatly reduced or absent (usually well-developed in *Peratherium*). The specimens are the same size as those of *N. minutus* McGrew, 1937 and are indistinguishable morphologically. The lower molars (Pl. 8, fig. 1; Pl. 9, figs. 1-3) in the San Diego sample referred to *Nanodelphys*, using the criteria for recognition discussed by Setoguchi (1973, p. 29-31), are indistinguishable from those in the holotype of *Peratherium californicum* Stock, 1936. There is little doubt that *P. californicum* in actuality should be considered a species of *Nanodelphys*. It seems very likely, indeed, that "*P. californicum*" and *N. minutus* could be considered conspecific using the paleontological morphospecies concept; they are morphologically indistinguishable. Nevertheless, the referred specimens are from quite different time intervals and geographic areas. I believe that different specific names should be maintained. Thus I here refer "*P. californicum*" to *Nanodelphys* but emend the suffix of the specific name to "*californicus.*"

The fact that "*Peratherium californicum*" has been found to represent a species of *Nanodelphys* does not eliminate *Peratherium* from the faunal list of the lower Sespe Fm. In the same paper in which *P. californicum* was named, Stock (1936:124) documented the presence of a second didelphid and referred to it as "*Peratherium* species" as represented by specimens LACM (CIT) 1942 and 1944. These specimens are indistinguishable from the San Diego material referred to above as *Peratherium* sp. cf. *P. knighti* and probably should be considered conspecific.

Dental measurements were taken as described above for *Peratherium*. Basic statistics on teeth are presented in Tables 3 and 4. As for *Peratherium*, all localities have been lumped as one statistical sample as no significant interlocality differences could be detected.

Premolars.—Specimens here identified as $P^{2\text{-}3}$ of *Nanodelphys* are done so with less certainty than was the case for *Peratherium*. The morphology of these specimens is virtually indtinguishable from those described for *Perathium* except for decidedly smaller size. The posterior one-third of P^3 (Pl. 6, fig. 1) is preserved in association with molars of *Nanodelphys* in UCMP 101933 and what remains in that specimen supports the identifications made.

TABLE 3. Standard statistics for upper teeth of *Nanodelphys californicus* from San Diego County, California.

		N	O. R.	$\bar{x}$	S. D.	SE$_{\bar{x}}$	V
P^3	A-P	3	1.124–1.280	1.205			
	W	3	0.580–0.645	0.616			
	A-P/W	3	1.743–2.207	1.966			
P^3	A-P	1	1.496				
	W	2	0.565–0.783	0.674			
M^1	A-P	11	1.327–1.593	1.455	0.086	0.026	5.9
	ANT-W	15	0.999–1.267	1.151	0.090	0.023	7.8
	POST-W	11	1.311–1.593	1.436	0.077	0.023	5.4
	ANT-W/POST-W	11	0.736–0.882	0.810	0.051	0.015	6.3
	A-P/ANT-W	11	1.078–1.536	1.259	0.126	0.038	10.0
	A-P/POST-W	11	0.858–1.180	1.016	0.079	0.024	7.8
M^2	A-P	9	1.215–1.496	1.337	0.091	0.030	6.8
	ANT-W	11	1.228–1.566	1.373	0.120	0.036	8.7
	POST-W	11	1.338–1.793	1.562	0.145	0.044	9.3
	ANT-W/POST-W	9	0.792–0.990	0.879	0.069	0.023	7.9
	A-P/ANT-W	8	0.901–1.060	0.988	0.055	0.019	5.6
	A-P/POSTW	8	0.829–1.008	0.877	0.060	0.021	6.8
M^3	A-P	12	1.213–1.618	1.462	0.107	0.031	7.3
	ANT-W	13	1.532–1.818	1.665	0.081	0.023	4.9
	POST-W	10	1.590–1.979	1.794	0.143	0.046	8.0
	ANT-W/POST-W	10	0.880–1.004	0.939	0.038	0.012	4.0
	A-P/ANT-W	10	0.757–0.935	0.868	0.052	0.016	6.0
	A-P/POST-W	10	0.714–0.907	0.815	0.060	0.019	7.4
M^4	A-P	4	0.980–1.082	1.043	0.045	0.022	4.3
	ANT-W	4	1.631–1.957	1.765	0.137	0.069	7.8
	POST-W	4	1.110–1.337	1.241	0.112	0.056	9.0
	ANT-W/POST-W	4	1.300–1.469	1.426	0.084	0.042	5.9
	A-P/ANT-W	4	0.553–0.617	0.592	0.028	0.014	4.7
	A-P/POST-W	4	0.802–0.883	0.843	0.044	0.022	5.2

TABLE 4. Standard statistics for lower teeth of *Nanodelphys californicus* from San Diego County, California.

		N	O. R.	$\bar{X}$	S. D.	SE$_{\bar{X}}$	V
P_3	A-P	3	1.039-1.158	1.091			
	W	3	0.487-0.531	0.509			
	A-P/W	3	1.957-2.378	2.149			
M_1	A-P	16	1.178-1.691	1.453	0.152	0.038	10.5
	W-TRI	16	0.570-0.859	0.713	0.086	0.022	12.0
	W-TAL	17	0.572-0.877	0.715	0.074	0.018	10.4
	W-TRI/W-TAL	16	0.892-1.121	1.001	0.067	0.017	6.7
	A-P/W-TRI	16	1.837-2.388	2.045	0.157	0.039	7.7
	A-P/W-TAL	16	1.911-2.229	2.040	0.102	0.026	5.0
M_2	A-P	13	1.365-1.625	1.514	0.100	0.028	6.6
	W-TRI	13	0.737-0.917	0.817	0.057	0.016	7.0
	W-TAL	13	0.699-0.889	0.775	0.056	0.015	7.2
	W-TRI/W-TAL	13	1.014-1.166	1.056	0.041	0.011	3.9
	A-P/W-TRI	13	1.675-2.091	1.856	0.113	0.031	6.1
	A-P/W-TAL	13	1.776-2.173	1.957	0.104	0.029	5.3
M_3	A-P	12	1.298-1.636	1.498	0.095	0.027	6.3
	W-TRI	13	0.726-0.894	0.824	0.047	0.013	5.7
	W-TAL	11	0.608-0.784	0.730	0.057	0.017	7.8
	W-TRI/W-TAL	11	1.076-1.212	1.137	0.041	0.012	3.6
	A-P/W-TRI	12	1.601-1.904	1.806	0.076	0.022	4.2
	A-P/W-TAL	11	1.846-2.282	2.050	0.135	0.041	6.6
M_4	A-P	6	1.368-1.538	1.460	0.071	0.029	4.9
	W-TRI	5	0.693-0.842	0.753	0.060	0.027	8.0
	W-TAL	6	0.503-0.639	0.588	0.051	0.020	8.7
	W-TRI/W-TAL	5	1.124-1.497	1.311	0.146	0.065	11.1
	A-P/W-TRI	5	1.817-2.027	1.926	0.101	0.045	5.2
	A-P/W-TAL	5	2.279-2.720	2.515	0.160	0.072	6.4

P_3 (Pl. 7, fig. 2) is preserved in the holotype of *Peratherium californicum*, here transferred to a species of *Nanodelphys*. Three isolated teeth from the San Diego samples closely match this tooth in size and morphology. The description closely follows that for the P_3 of *Peratherium* except that the labial convexity of the *Nanodelphys* tooth is less marked, the posterior accessory cusp is much lower or absent, the size is smaller, and there is less concavity on the posterolingual part of the tooth. More anterior parts of the lower dentition for *Nanodelphys* from the San Diego samples have not yet been recognized.

Antiquity of the genus.—Nanodelphys was originally recognized from rocks of Oligocene age in Nebraska. It has been recognized subsequently in the Hendry Ranch Member of the Tepee Trail Fm. of Wyoming. Potassium-argon dating techniques on different levels within the Hendry Ranch Member give dates of 41 and 39 million years before present (Riedel, 1969), well up within what is generally considered to be Uintan of the late Eocene (see Evernden, *et al.,* 1964). Numerous elements of the mammalian fauna from the San Diego Eocene also suggest a Uintan age, but of a considerably older part of it. Faunal similarities are greater with Bridgerian (roughly late early Eocene) than with Chadronian (early Oligocene) assemblages in contrast to the Hendry Ranch Member in which the opposite is largely true. The San Diego terrestrial Eocene deposits interdigitate with marine sediments considered to be of Narizian and Ulatisian age (Kennedy and Moore, 1971) in West Coast stratigraphic terminology, which probably correlate with Lutetian strata in Europe (see Bukry and Kennedy, 1969 and Bukry, 1971). These units are generally considered to be mid or early late Eocene in age. Thus the San Diego specimens seemingly represent the oldest known record of *Nanodelphys.* Nevertheless, the specimens somewhat unexpectedly show fully the characters used to diagnose the genus and one might expect to find more primitive species of *Nanodelphys* in Bridgerian or even Wasatchian deposits.

Infraclass EUTHERIA Gill, 1872
Order ?PRIMATES Linnaeus, 1758
Superfamily MICROSYOPOIDEA (Osborn and Wortman, 1892)
Family MICROSYOPIDAE Osborn and Wortman, 1892
Subfamily UINTASORICINAE Szalay, 1969b
Genus *Uintasorex* Matthew, 1909

Uintasorex montezumicus n. sp.

Pl. 10, figs. 1-4; Pl. 11, figs. 1-4

Type.—UCMP 104179, isolated right M^2 (Pl. 11, fig. 3).

Type locality.—V-71211, "Solstice Slope," Mission Valley Fm., San Diego, San Diego Co., California.

Referred specimens.—2 P^4's, 13 M^1's, 18 M^2's, 5 M^3's, 4 P_4's, 18 M_1's, 13 M_2's, 8 M_3's (all UCMP specimens).

Localities.—Friars Fm.: V-6871, V-6882, V-6888, V-68116, V-71175, V-71176, V-71183; Mission Valley Fm.: V-71180, V-71211, V-72157, V-72158, V-72176, V-72177, V-72179, V-73138, V-73139.

Distribution of genus.—Green River Fm. (Bridgerian), Utah; Wasatch (Wasatchian), Bridger (Bridgerian), and Tepee Trail (Hendry Ranch Member, Uintan) formations, Wyoming; Friars and Mission Valley formations (Uintan), California.

Diagnosis.—Basically similar dentally to *Uintasorex parvulus* except *U. montezumicus* has longer talonid on P_4 relative to trigonid, completely basined talonid on P_4, no cingulum on labial base of P_4 trigonid, paracnid of M_1 closely appressed to metaconid, reduced labial cingulum on M_{1-3}, protocone of M^{1-3} shifted anteriorly to position nearly directly lingual to paracone, anterolingual cingulum lacking or greatly reduced on M^{1-3}, posterolingual cingulum hypertrophied on M^{1-2}, paraconule lacking or reduced to bump on preprotocrista.

The entire *Uintasorex* sample from San Diego is represented by isolated teeth including only $P^4_4M^{1-3}_{1-3}$; not a single jaw fragment of significance has yet been recovered. Nevertheless, the San Diego collection represents the largest yet available for the genus. The material was recovered from two geological formations and 16 separate localities. However, no significant differences could be detected between the specimens from the Friars and Mission Valley formations nor between the various localities. Thus all statistical data were lumped in the preparation of Tables 5 and 6 and the descriptions were written as though but a single species were involved.

A-P measurements on M^{1-2} were taken along an axis that parallels an imaginary line connecting the apices of the paracone and metacone. On M^3 the A-P measurement was taken at right angles to the anterior border of the tooth. A-P measurements on the P_4 and lower molars were taken along an axis that parallels an imaginary line that roughly divides the tooth in occlusal view into equal right and left halves. All width measurements were taken from labial to lingual edges of teeth at right angles to the A-P axis. Details are as follow.

P^4 measurements

A-P From edge of anterior-most projection of anterior paracrista to edge of posterior-most projection of posterior paracrista perpendicular to axis that divides the tooth into roughly equal anterior and posterior halves.
W Along transverse line measuring greatest width between edges of paracone (posterior paracrista) and protocone.

Upper molar measurements

A-P M^{1-2} from edge of anterior-most projection of anterior paracrista to edge of posterior-most projection of posterior metacrista.
M^3 from edge of anterior-most projection of anterior paracrista to edge of posterior-most bulge of metacone.
ANT-W M^{1-3} along transverse line measuring greatest width between edges of paracone and protocone.
POST-W M^{1-2} along transverse line measuring greatest width between edges of metacone and protocone. M^3 not taken.

P_4 measurements

A-P From edge of anterior-most projection of trigonid to posterior-most edge of talonid.
W Greatest width of trigonid area.

Lower molar measurements

A-P From edge of anterior-most projection of paraconid to edge of posterior-most projection of hypoconulid.
W-TRI Greatest width between edges of protoconid and metaconid.
W-TAL Greatest width between edges of hypoconid and entoconid.

Description of lower dentition.—The P_4 (Pl. 10, fig. 1) is apparently highly variable in construction. A small paraconid is present, for example, on only two of the four available specimens. When present, the paraconid is little more than a sharp lingual turn in the anterior crest of the protoconid. When absent, the anterior face of the protoconid is fully rounded with no anterior crest. A small metaconid is consistently present as a shoulder on the much taller protoconid. The metaconid is either placed directly lingual to the apex of the protoconid or posterolingual to it. The trigonid lacks any trace of a labial cingulum. A talonid is consistently well developed and is usually completely rimmed as a basin by a more or less continuous ridge that runs down the posterolabial corner of the protoconid, turns linguad along the posterior border of the talonid then runs anteriad and eventually up to the apex of the metaconid. The result is a concave posterior face of the trigonid. Two or three variably

TABLE 5. Standard statistics for lower teeth of *Uintasorex montezumicus* n. sp. from San Diego County, California.

		N	O. R.	$\bar{x}$	S. D.	SE $_{\bar{x}}$	V
P_4	A-P	3	0.739-0.817	0.778			
	W	3	0.449-0.612	0.553			
	$\frac{\text{A-P}}{\text{W}}$	3	1.301-1.646	1.427			
M_1	A-P	18	0.901-1.063	0.985	0.042	0.010	4.3
	W-TRI	18	0.596-0.774	0.681	0.047	0.011	6.9
	W-TAL	18	0.694-0.835	0.784	0.038	0.009	4.9
	$\frac{\text{W-TRI}}{\text{W-TAL}}$	18	0.792-0.946	0.869	0.047	0.011	5.4
	$\frac{\text{A-P}}{\text{W-TRI}}$	18	1.261-1.621	1.452	0.095	0.022	6.5
	$\frac{\text{A-P}}{\text{W-TAL}}$	18	1.166-1.418	1.259	0.067	0.016	5.3
M_2	A-P	11	0.941-1.085	0.999	0.046	0.014	4.6
	W-TRI	11	0.617-0.784	0.691	0.052	0.016	7.5
	W-TAL	12	0.693-0.894	0.796	0.063	0.018	7.9
	$\frac{\text{W-TRI}}{\text{W-TAL}}$	11	0.820-0.920	0.858	0.029	0.009	3.4
	$\frac{\text{A-P}}{\text{W-TRI}}$	11	1.287-1.614	1.451	0.099	0.030	6.8
	$\frac{\text{A-P}}{\text{W-TAL}}$	11	1.085-1.359	1.244	0.076	0.023	6.1
M_3	A-P	8	0.928-1.243	1.131	0.103	0.037	9.1
	W-TRI	8	0.519-0.710	0.612	0.059	0.021	9.6
	W-TAL	8	0.601-0.800	0.701	0.074	0.025	10.6
	$\frac{\text{W-TRI}}{\text{W-TAL}}$	8	0.812-0.968	0.891	0.051	0.018	5.7
	$\frac{\text{A-P}}{\text{W-TRI}}$	8	1.516-2.304	1.861	0.255	0.090	13.7
A-P	$\frac{\text{A-P}}{\text{W-TAL}}$	8	1.434-1.990	1.654	0.205	0.073	12.4

developed cuspules are found on the posterior rim of the talonid. The talonid comprises at least half of the total length of the P_4.

The paraconid of the lower molars (Pl. 10, figs. 2-4) is either miniscule or completely absent as a discrete cusp. On 12 of 16 molars identified as M_1 a minute gap is present between the closely-appressed apices of the paraconid and metaconid. Most commonly on M_1 a ridge runs straight anteriad from the apex of the protoconid then turns sharply linguad and continues to curve posteriad in the general direction of the metaconid apex, increasing in elevation as it goes. The highest point on the ridge, usually immediately adjacent to the gap from the metaconid, is here referred to as the paraconid; it is generally not expanded as a distinct cusp. The remaining 4 of the above-mentioned 16 molars show no gap whatever between the paraconid region and the apex of the metaconid; the anterior ridge is complete between the apices of the protoconid and metaconid. Such is also the case in all molars here identified as M_2 and M_3. A second transverse ridge is usually present on the

TABLE 6. Standard statistics for upper teeth of *Uintasorex montezumicus* n. sp. from San Diego County, California.

		N	O.R.	$\bar{x}$	S. D.	SE $\bar{x}$	V
P^4	A-P	2	0.728–0.795	0.762			
	W	2	0.814–0.898	0.856			
	$\frac{\text{A-P}}{\text{W}}$	2	0.885–0.894	0.890			
M^1	A-P	13	0.876–1.085	1.014	0.060	0.017	5.9
	ANT-W	12	0.957–1.150	1.055	0.071	0.021	6.7
	POST-W	13	1.022–1.238	1.124	0.075	0.021	6.7
	$\frac{\text{ANT-W}}{\text{POST-W}}$	12	0.898–0.983	0.944	0.025	0.007	2.7
	$\frac{\text{A-P}}{\text{ANT-W}}$	12	0.898–1.035	0.962	0.041	0.012	4.3
	$\frac{\text{A-P}}{\text{POST-W}}$	12	0.817–0.996	0.908	0.046	0.013	5.1
M^2	A-P	18	0.881–1.092	0.980	0.056	0.013	5.7
	ANT-W	18	1.046–1.275	1.152	0.060	0.014	5.2
	POST-W	18	1.035–1.272	1.165	0.068	0.016	5.8
	$\frac{\text{ANT-W}}{\text{POST-W}}$	18	0.953–1.040	0.990	0.026	0.006	2.6
	$\frac{\text{A-P}}{\text{ANT-W}}$	18	0.780–0.927	0.851	0.031	0.008	3.6
	$\frac{\text{A-P}}{\text{POST-W}}$	18	0.796–0.901	0.842	0.029	0.007	3.4
M^3	A-P	5	0.906–1.001	0.957	0.039	0.017	4.1
	ANT-W	5	1.020–1.113	1.085	0.039	0.017	3.6
	$\frac{\text{A-P}}{\text{ANT-W}}$	5	0.825–0.962	0.883	0.055	0.025	6.2

posterior end of the trigonid of the molars that connects the apices of the protoconid and metaconid. The general presence of these two ridges results in an isolated enamel lake in the center of the trigonid. A rather weakly developed labial cingulum is found on about half of the molars in the area of the junction of the trigonid and talonid.

The talonid is shorter relative to the trigonid in teeth here identified as M_1 than in those identified as M_2. The talonid is deeply basined in all molars, being completely rimmed. The hypoconulid on $M_{1\text{-}2}$ is by far the weakest of the talonid cuspules, being little more than an elevation that is sometimes crenulated in the ridge connecting the apices of the entoconid and hypoconid. The hypoconulid on M_3, however, is grotesquely enlarged and rivals or exceeds in height the entoconid, which is generally the tallest of the talonid cusps. The hypoconulid on all molars is set significantly more closely to the entoconid than to the hypoconid and is invariably well separated from the other cusps by sharply-formed gaps. The cristid obliqua strikes the trigonid near the transverse center of the posterior wall of the protoconid and almost always stops well short of contact with its apex.

Comparisons of lower dentitions with those from Rocky Mountain localities.—The San Diego specimens of lower teeth are generally remarkably similar in detail to those from Utah and Wyoming (see Szalay, 1969b:7-15). However, a few significant differences do exist. For example, the talonids of P_4's from San Diego are longer relative to the total length of the tooth (50% or more *vs.* about 30-40%). Also, the talonid of P_4 is completely basined in the San Diego specimens in contrast to the anteroposteriorly-aligned central ridge seen in the holotype of *Uintasorex parvulus* and YPM 13519 (see Szalay, 1969b, fig. 1), another specimen referred to that species. The construction of the talonid in the San Diego specimens thus seems to be more advanced than in those from Bridgerian localities. A weak cingulum is present on the labial base of the trigonid of YPM 13519; no hint of such a cingulum is seen in any of the four San Diego specimens of P_4's.

The paraconid region of M_1's in the San Diego specimens is also more specialized than in the homologous teeth from the Bridgerian and apparently from Uintan (see Robinson, 1968, fig. 11) localities as well as in the Rocky Mountains in that the trigonids of the San Diego specimens are not wide open lingually. That is, the gap between the apices of the paraconid and metaconid is extremely constricted in the San Diego specimens and, as described above, is sometimes nonexistent. Such a condition makes separation of isolated M_1's from isolated M_2's quite difficult and assignment errors likely have been made in the present study. In any case, the condition seen in the San Diego M_1 paraconids is considerably specialized from the primitive therian condition. Also, the degree of development of the labial cingulum in $M_{1\text{-}3}$ is much less in the San Diego specimens than in those from the Western Interior. The cingulum in the latter is usually stronger and more extensive anteroposteriorly, commonly running nearly the entire length of the tooth (*e.g.*, YPM 13519 and AMNH 55664).

Finally, assuming that the system used here in taking dental measurements is approximately that used by Szalay (1969b, Tables 1 and 2), the San Diego specimens are generally smaller (Tables 5 and 6) than those from the Rocky Mountain localities. Indeed, *Uintasorex montezumicus* from San Diego must have ranked among the tiniest primates to have ever lived.

Description of upper dentition.—Two isolated teeth have been found that I identify as likely candidates for P^4's (Pl. 11, fig. 1) of *Uintasorex*, teeth that have never before been described. The teeth are three-rooted with a strong protocone, paracone, and no metacone. The protocone is much lower than the paracone and has a well-developed preprotocrista and postprotocrista that run respectively to the anterolabial and posterolabial corners of the tooth. There is no separate anterior cingulum. Conules are lacking. The protocone is separated by a broad valley from the laterally compressed paracone. A strong preparacrista and postparacrista run to the anterolabial and posterolabial corners of the tooth to join with their respective protocristae. There is no separate parastyle.

The upper molars (Pl. 11, figs. 2-4) have a broadly flattened protocone that is displaced anteriorly such that its apex is nearly directly lingual to the apex of the paracone. A posterolingual cingulum is consistently present and strong in $M^{1\text{-}2}$ but usually rather weak in M^3. The cingulum usually begins labially at the base of the metaconule and runs linguad to terminate at the posterolingual edge of the protocone. Commonly the edge of the cingulum projects slightly lingual to the edge of the protocone, especially in M^1. Usually there is no ridge connecting the apices of the cingular cusp and protocone, but occasionally one is present (*e.g.*, UCMP 106884). The lingual root is usually quite round in cross-section and supports only the anterior-most part of the posterolingual cingulum; the bulk of the cingulum projects posteriad from the base of the root. An anterolingual cingulum is not present on any available M^1 or M^3, but is present as a weak structure on 4 of 18 M^2's and as a strong cingulum on 1 M^2 (UCMP 106810). When present, the cingulum begins in the paraconular region and projects to a point well short of the lingual edge of the protocone.

The paracone and metacone of the upper molars are generally conically shaped, but show tendencies toward lateral compression in M^1. The paracone is almost always the largest of the molar cusps, even in M^1. Pre- and post-paracristae are well developed and anteroposteriorly aligned. A stylar shelf is lacking. The metaconule is a very conspicuous cusp. Its posterior crista runs labiad to join at the posterolabial corner of the tooth with the posterior metacrista. The anterior crista of the metaconule invariably terminates at the anterolingual base of the metacone. The paraconule, on the other hand, is frequently lacking entirely. Most commonly, it is represented only by a rather weak bump on the extension of the anterior protocrista. The latter continues labiad to the anterolabial corner of the tooth where it joins with the anterior paracrista. The posterior protocrista terminates at the base of the metaconule immediately anterolingual to its apex.

Comparisons of upper dentitions with those from Rocky Mountain localities.—Differences between the upper molars of the San Diego species and those of *Uintasorex parvulus* (see Gazin, 1958, Pl. 14, fig. 2) and *Uintsorex* sp. (see Szalay, 1969b, figs. 7, 9, and 10) from Bridgerian Green River beds of Utah are rather obvious. The most important revolve around the construction of the protocone and its attached cingula. The protocone in the Utah specimens is transversely more centrally placed between the apices of the paracone and metacone; the protocone from the San Diego specimens is shifted more anteriorly to rest more directly lingual to the apex of the paracone. As a result, the anterolingual cingulum is greatly reduced or lost in the San Diego specimens in contrast to its strong development in those from Utah. Concommitantly, the posterolingual cingulum in the San Diego teeth is hypertrophied in comparison to those from the Rockies. The paraconule seems to be better developed in the Utah specimens than in those from San Diego in which it is either absent or little more than a lump on the preprotocrista. The conditions seen in the San Diego specimens are clearly more specialized from the primitive therian condition than those seen in the Bridgerian specimens from the Western Interior.

Affinities.—The new species from San Diego sheds no new light on the affinities of the genus beyond the discussions by Szalay (1969a and b). He emphasized (1969b:17) the similarities of *Uintasorex parvulus* with *Niptomomys doreenae* from the Wasatchian of Colorado (see McKenna, 1960 and Bown and Gingerich, 1972). As would perhaps be expected, *U. montezumicus* shows less similarity with *Niptomomys.* For example, the P^4 of *Niptomomys* (*e.g.*, YPM 23600) has a ridge that runs labiad from the apex of the protocone more or less continuously to the apex of the paracone; such a ridge is lacking in *U. montezumicus* and the condition has not been described in *U. parvulus.* Additionally, a distinct anterior cingulum exists on the P^4 of *Niptomomys* that runs labiad from the anterolingual base of the protocone to a distinct parastyle. Both these structures are absent on the P^4 of *U. montezumicus* in which the function of an anterior cingulum is accomplished by the preprotocrista. The upper molars of *Niptomomys* also show numerous differences from those of *U. montezumicus* in that the former has a well developed anterolingual cingulum, somewhat weaker posterolingual cingulum, a stronger paraconule, and a hint of a mesostyle (*e.g.*, YPM 23600). Differences between the two species in the lower molars are less obvious and agree with those already spelled out by Szalay (1969b:18). In short, I fully agree with Szalay's argument (1969b:17) that the generic separation between *Uintasorex* and *Niptomomys* is justified and desirable.

Importance of U. montezumicus.—The new species of *Uintasorex* described here is primarily of significance because of its aid in helping to recognize the much greater geographic range of the genus than was realized before. Although clearly distinct at the species level from *U. parvulus,* the two species are certainly similar morphologically and probably were very closely related. In fact, no features are present in the known antomy of *U. parvulus* that would eliminate the possibility of its phylogenetic ancestry to *U. montezumicus.* Although *U. montezumicus* shows numerous dental characters advanced beyond those seen in *U. parvulus,* genetic continuity between *Uintasorex* populations in the Rocky Mountain states and southern California during the earlier Eocene is strongly suggested.

BIOGEOGRAPHICAL IMPLICATIONS

All three California species discussed in this paper are either conspecific with or very closely similar to taxa originally described from localities in the Rocky Mountain or High Plains states. Other species of mammals and lower vertebrates (see Schatzinger, 1975) have also been found in common within approximately contemporaneous strata in the two areas. The extent of faunal similarities will be more thoroughly reviewed elsewhere, but it now seems clear that overland dispersal routes were readily available between the West Coast and midcontinent of North America during at least some of the earlier part of the Eocene. The three species discussed here (two small opossums and a tiny ?primate) were probably semi-arboreal forest-associated kinds, dependent upon vegetative cover. Detailed information on their ecological requirements, of course, will never be known. It seems likely, however, that the more tropical Eocene climate allowed the development of a continuous forest cover or at least savannah-like environment that provided broad areas of suitable habitat for long-distance intracontinental dispersal of these kinds of small animals. Paleobotanical evidence is also consistent with the presence of geographicaly widespread warm-environment floras in the Northern Hemisphere during the Eocene (see Wolfe, 1975: 269-271).

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Department of Zoology, San Diego State University, San Diego, California 92182. Present address: Department of Geology, The University of Wyoming, Laramie, Wyoming 82071.

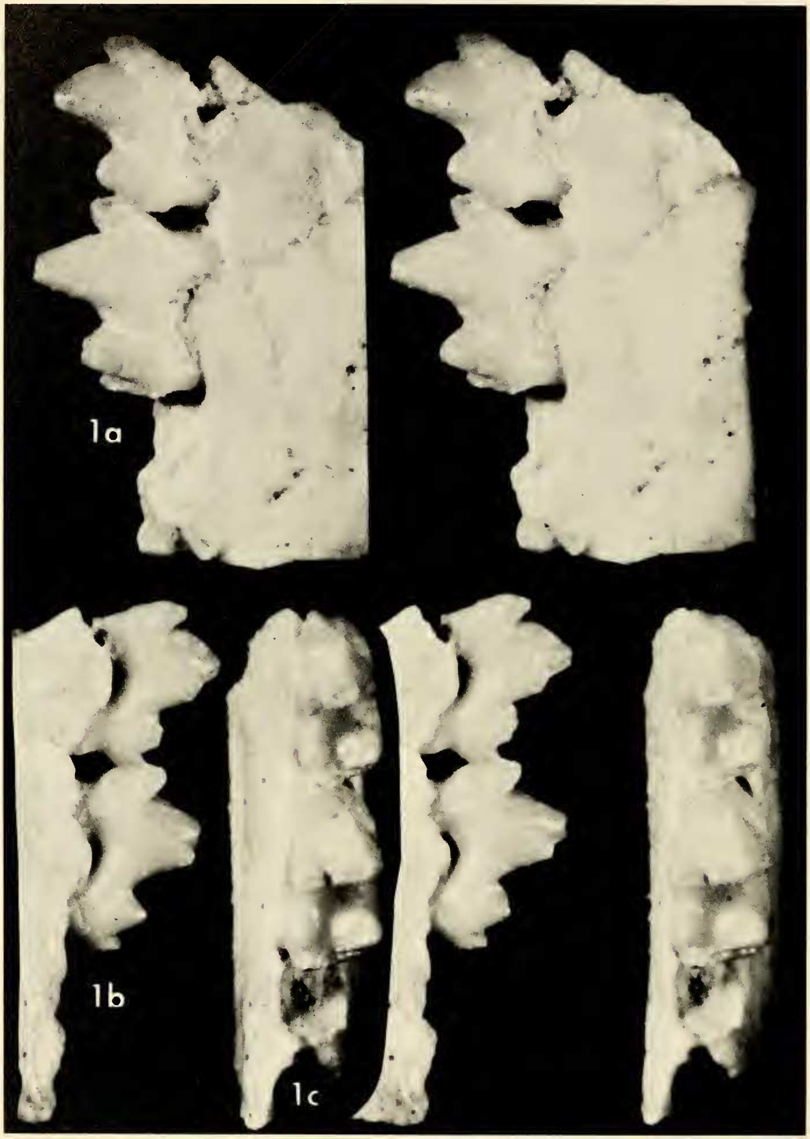

Plate 1. Stereophotographs (15×) of right mandibular fragment (UCMP 110224) with M_{1-2} of *Peratherium* sp. cf. *P. knighti* from San Diego Co., California. a, b, and c represent labial, lingual, and occlusal views, respectively.

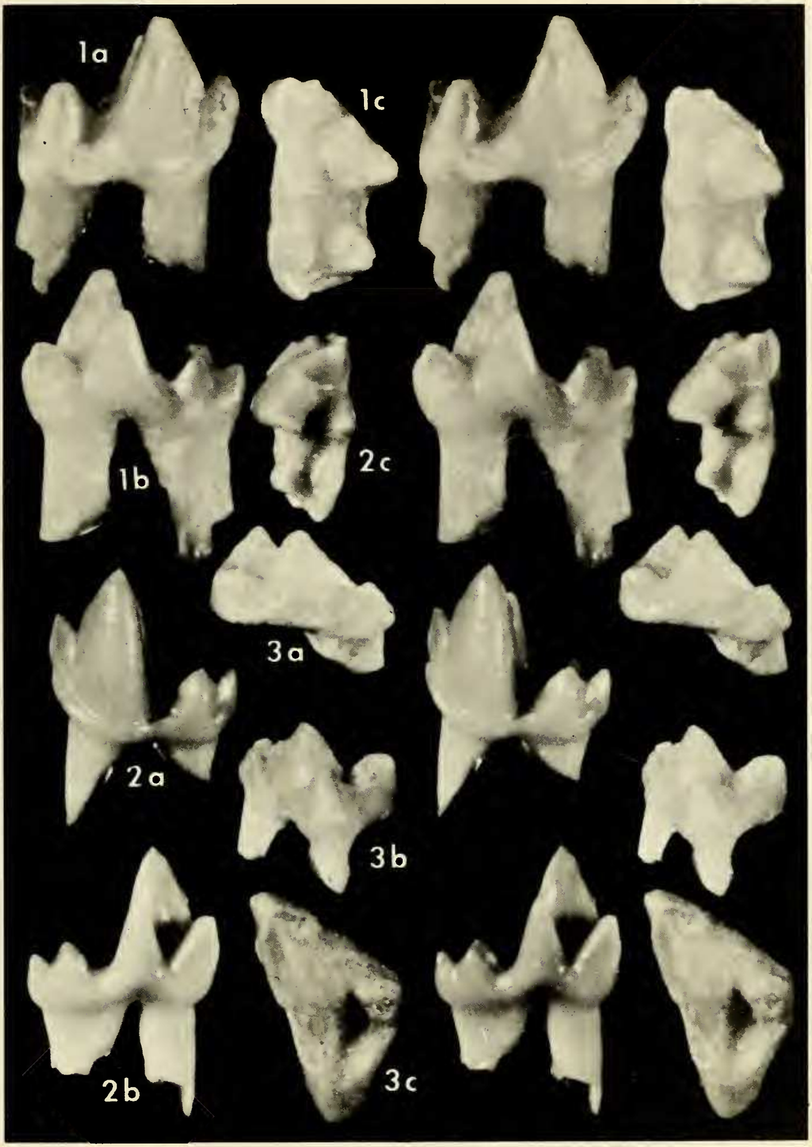

Plate 2. Stereophotographs (15×) of isolated molars of *Peratherium* sp. cf. *P. knighti* from San Diego Co., California. 1. UCMP 109910, right M_3; 2. UCMP 106384, left M_4; 3. UCMP 101220, left M^4. a, b, and c represent labial, lingual, and occlusal views, respectively.

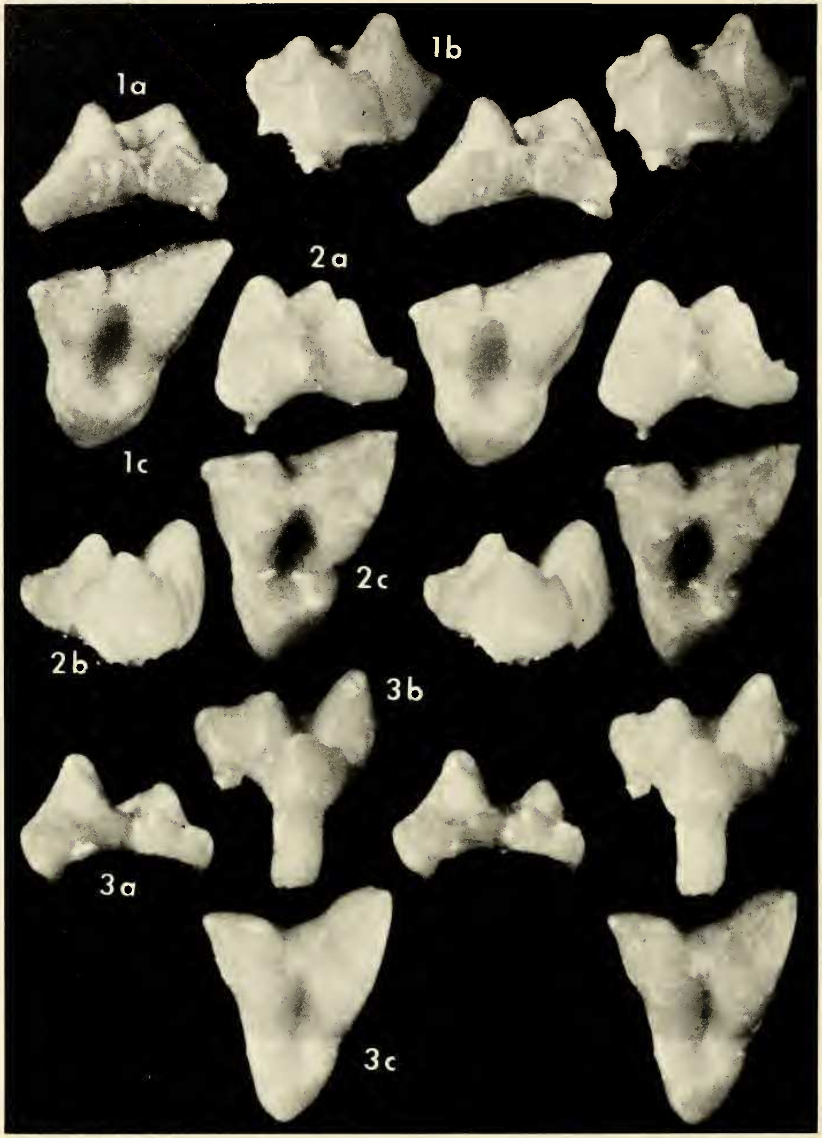

Plate 3. Stereophotographs (15×) of isolated upper molars of *Peratherium* sp. cf. *P. knighti* from San Diego Co., California. 1. UCMP 101549, left M^1; 2. UCMP 101132, left M^2; 3. UCMP 109647, left M^3. a, b, and c represent labial, lingual, and occlusal views, respectively.

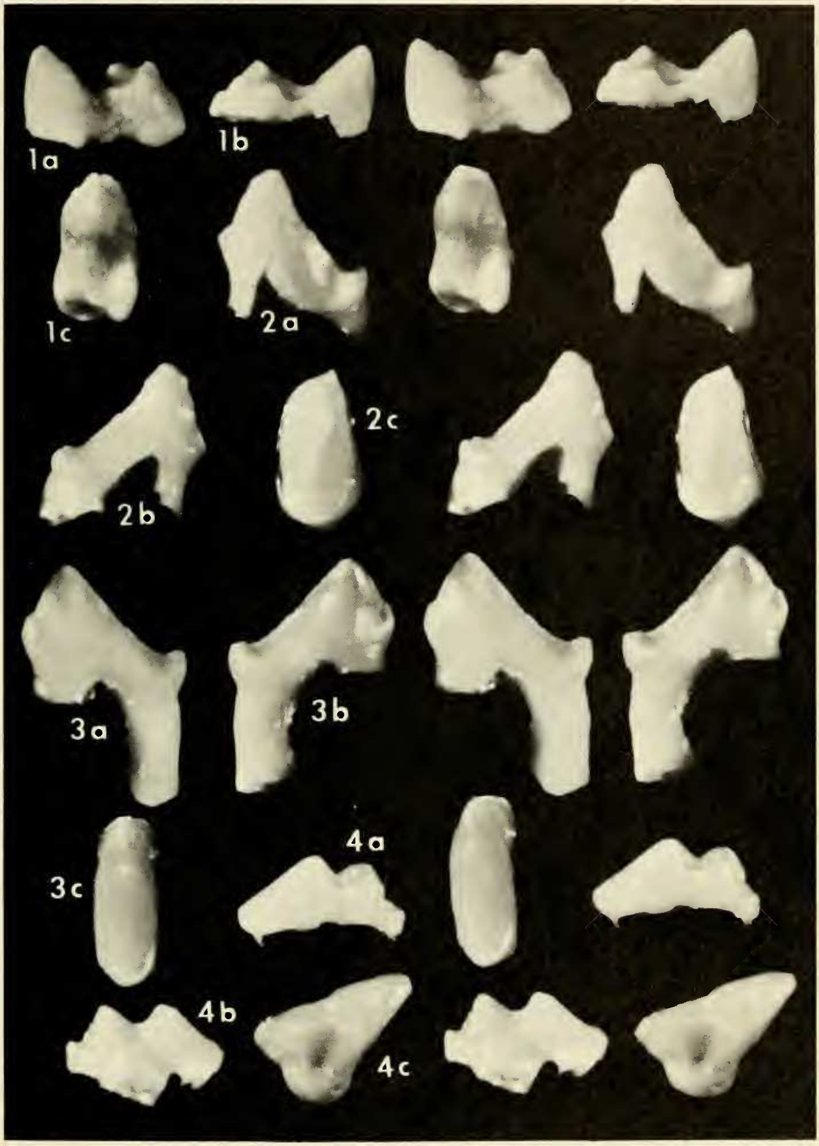

Plate 4. Stereophotographs of isolated premolars of *Peratherium* sp. cf. *P. knighti* from San Diego Co., California. 1. UCMP 106523, left "DP$_3$" (15×); 2. UCMP 106051, left P$_2$ (20×); 3. UCMP 101188, left P$_3$ (15×); 4. UCMP 101548, left "DP^3" (15×). a, b, and c represent labial, lingual, and occlusal views, respectively.

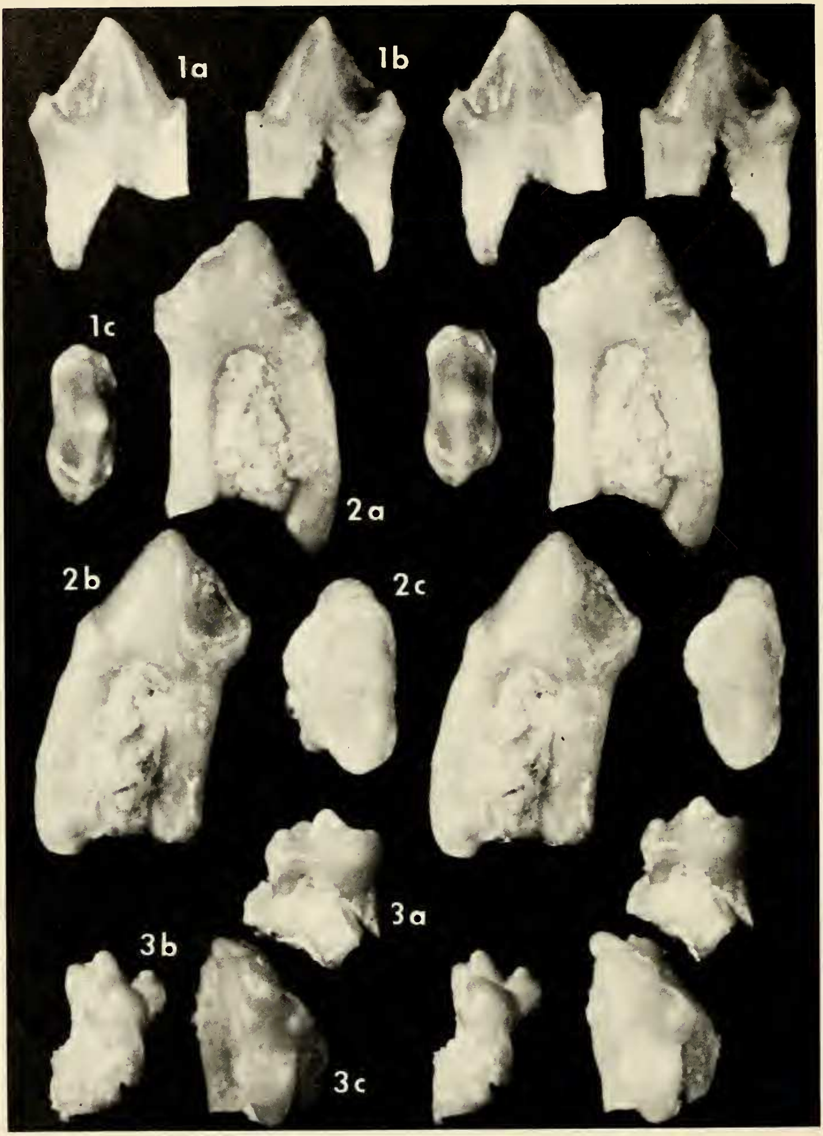

Plate 5. Stereophotographs of isolated teeth of didelphids from San Diego Co., California. 1. UCMP 106273, left P^2 (20×) of *Peratherium* cf. *P. knighti*; 2. UCMP 106371, left P^3 (15×) of *P.* cf. *P. knighti*; 3. UCMP 109578, left M^4 (15×) of *Nanodelphys californicus*. a, b, and c represent labial, lingual, and occlusal views, respectively.

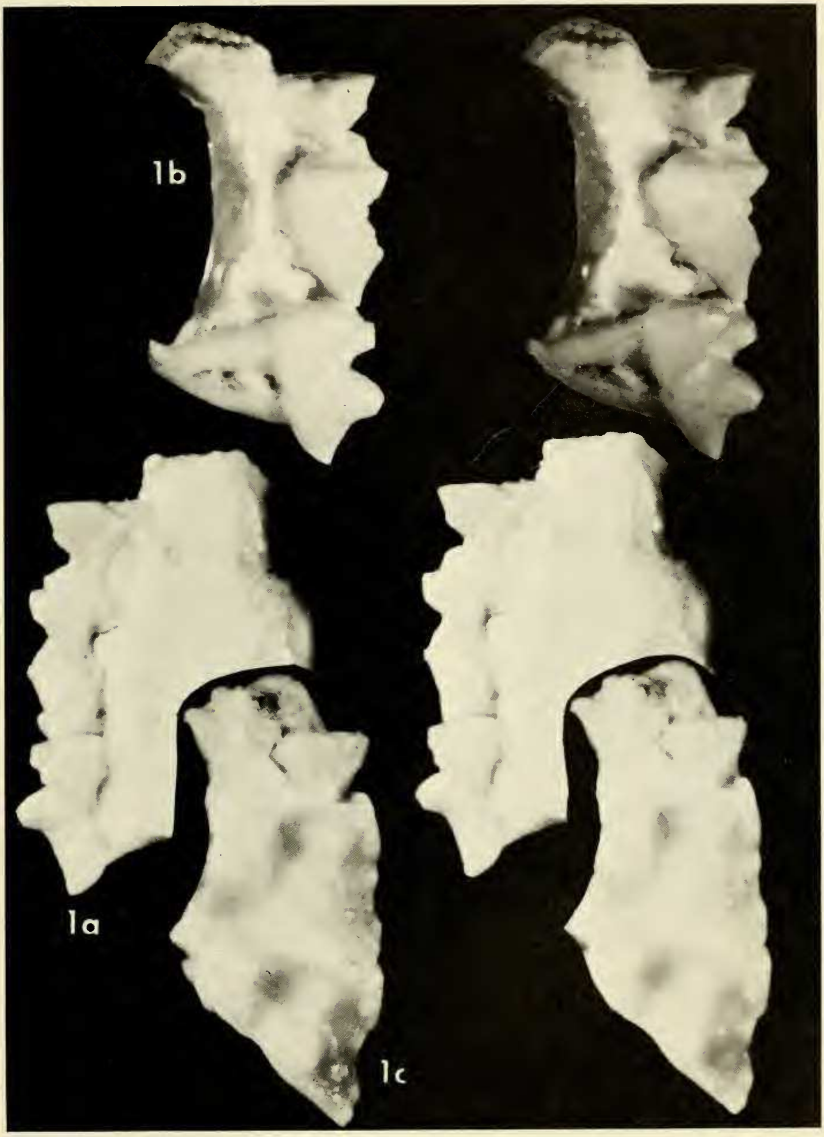

Plate 6. Stereophotographs (20×) of left maxillary fragment (UCMP 101933) with part of P^3 and complete $M^{1\text{-}2}$ of *Nanodelphys californicus* from San Diego Co., California. a, b, and c represent labial, lingual, and occlusal views, respectively.

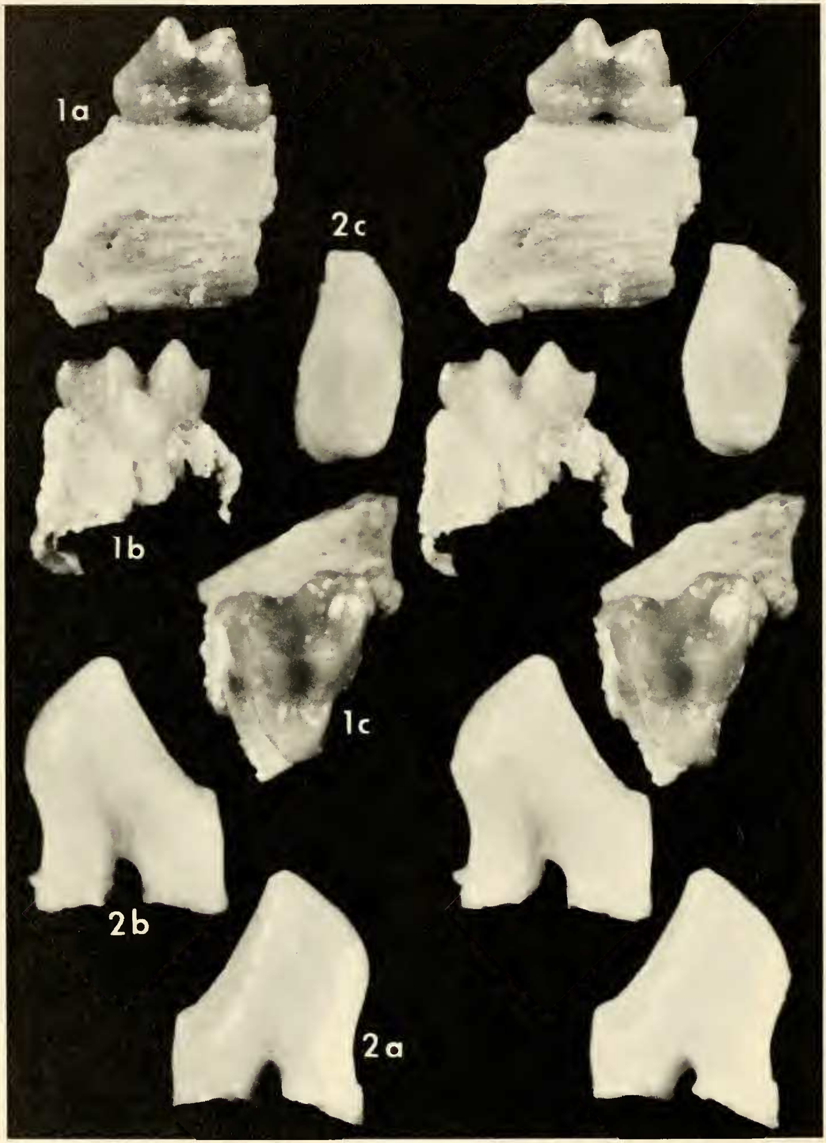

Plate 7. Stereophotographs of teeth of *Nanodelphys californicus* from San Diego Co., California. 1. UCMP 96474, left M^3 (15×); 2. UCMP 101521, right P_3 (30×). a, b, and c represent labial, lingual, and occlusal views, respectively.

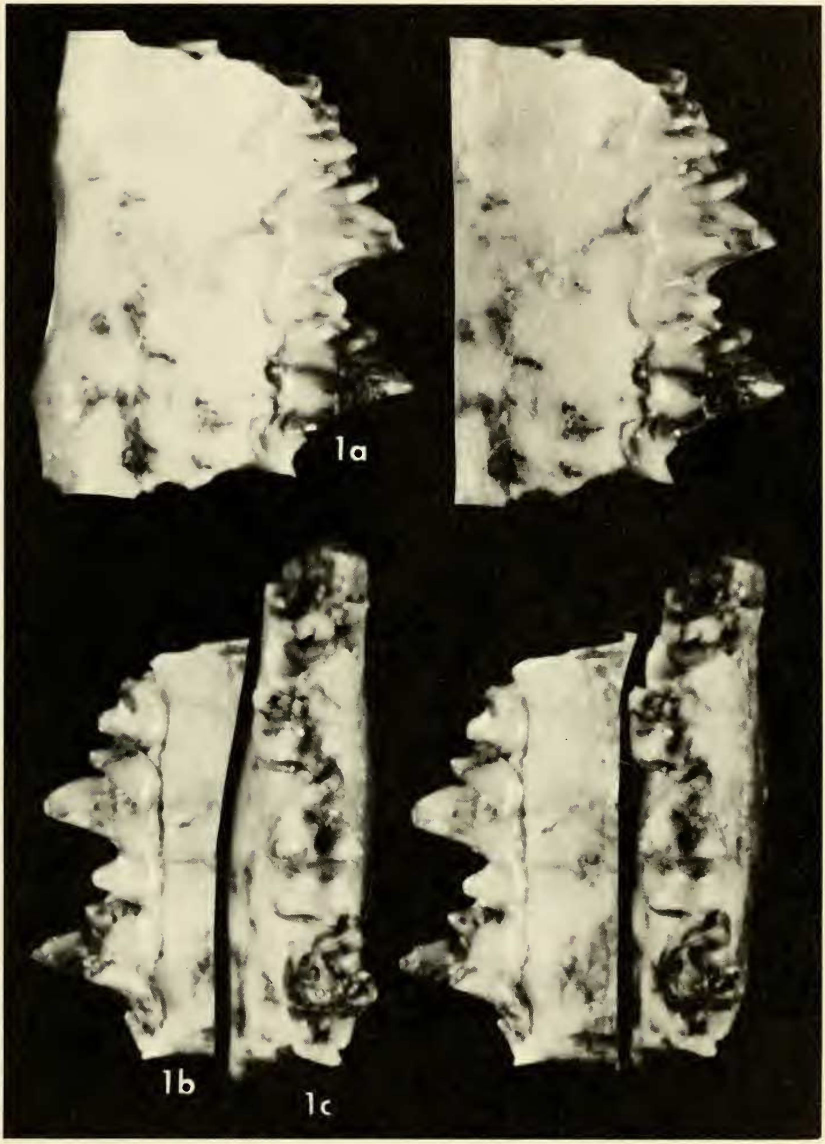

Plate 8. Stereophotographs (20×) of left mandibular fragment (UCMP 104153) with talonid of M_1, complete M_2, and trigonid of M_3 of *Nanodelphys californicus* from San Diego Co., California. a, b, and c represent labial, lingual, and occlusal views, respectively.

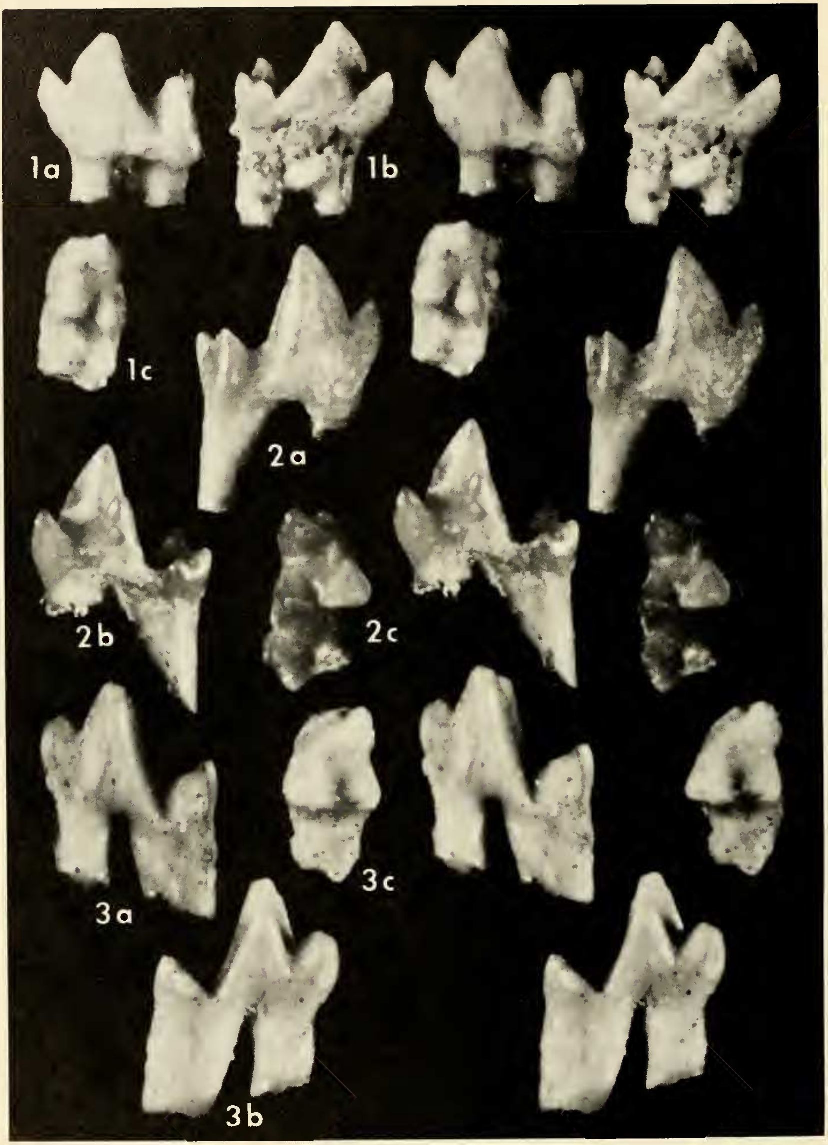

Plate 9. Stereophotographs (20×) of isolated lower molars of *Nanodelphys californicus* from San Diego Co., California. 1. UCMP 106372, left M_1; 2. UCMP 109783, right M_3; 3. UCMP 96165, left M_4. a, b, and c represent labial, lingual, and occlusal views, respectively.

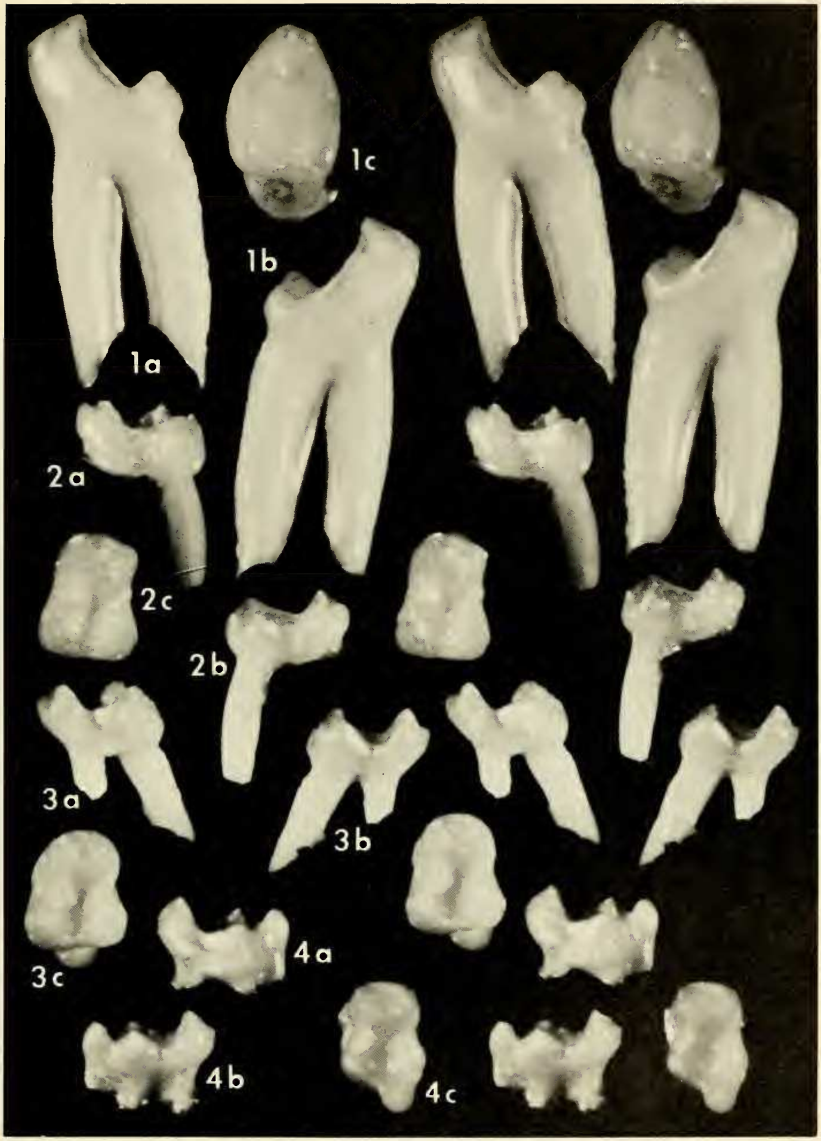

Plate 10. Stereophotographs of left isolated lower teeth of *Uintasorex montezumicus* n. sp. from San Diego Co., California. 1. UCMP 109808, P_4 (30×); 2. UCMP 101504, M_1 (20×); 3. UCMP 109997, M_2 (20×); 4. UCMP 109569, M_3 (20×). a, b, and c represent labial, lingual, and occlusal views, respectively.

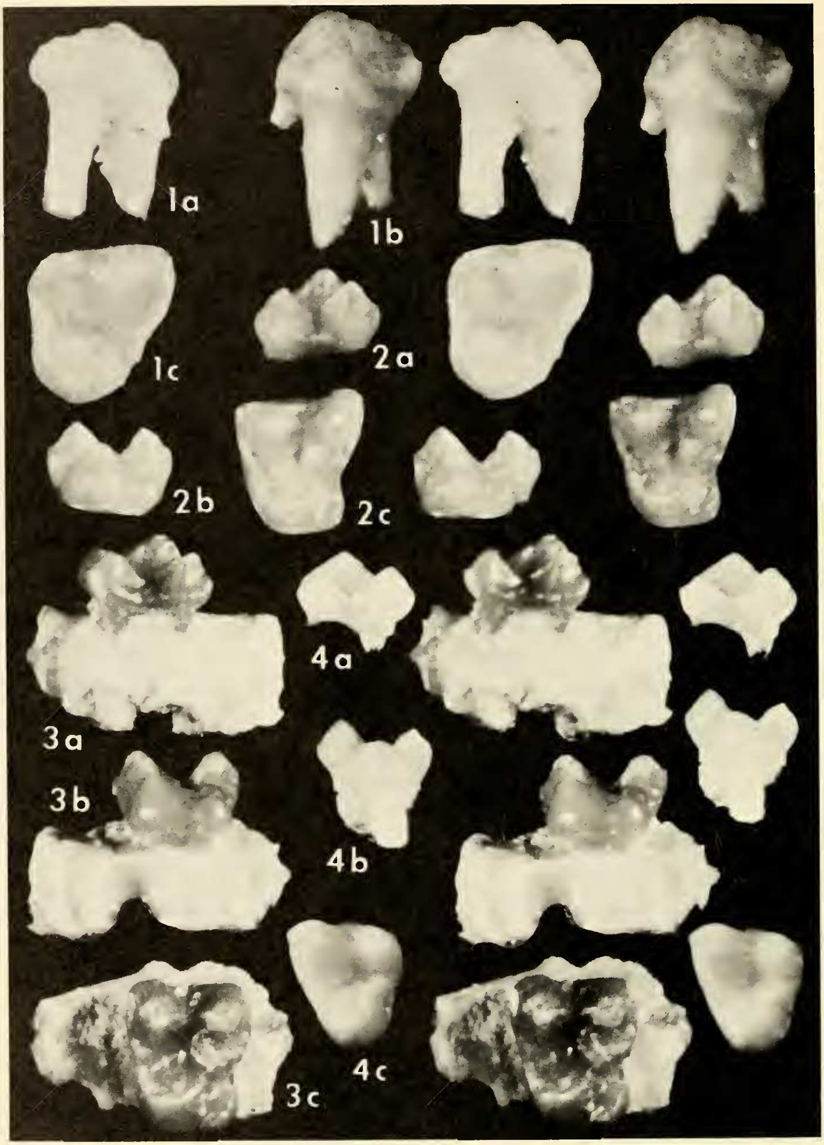

Plate 11. Stereophotographs of upper teeth of *Uintasorex montezumicus* n. sp. from San Diego Co., California. 1. UCMP 106886, isolated left P^4 (30×); 2. UCMP 106784, isolated right (photographically reversed) M^1 (20×); 3. UCMP 104179 (holotype), right (photographically reversed) maxillary fragment with M^2 (20×); 4. UCMP 103914, isolated left M^3 (20×). a, b, and c represent labial, lingual, and occlusal views, respectively.